

## CLAIMS

I claim:

1. A welding process comprising the steps of:
  - (a) providing at least two metal plates having upper and lower surfaces and ends;
  - 5 (b) positioning said plates end-to-end on a welding bed forming a weld butt between said ends;
  - (c) arcing electric current from a source of electric current to said plates, thereby melting said ends and creating a welded seam between said plates;
  - (d) applying pressure to a surface of said plates with at least one pressure applicator  
10 positioned on each side of said weld butt, said pressure applicators configured to extend behind said source of electric current, said pressure applicators configured to apply sufficient pressure to said plates to prevent said seam from being substantially distorted while said welded seam solidifies; and
  - (e) moving said current source along a path substantially following said weld butt  
15 between said plates.
2. The process according to claim 1 wherein said pressure applicators comprise one or more rollers.
3. The process according to claim 2 further comprising the step of securing said plates to said bed.
- 20 4. The process according to claim 1 wherein at least one of said pressure applicators is horizontally positionable.
5. The process according to claim 1 wherein at least one of said pressure applicators is vertically positionable.

6. The process according to claim 1 further comprising the step of applying pressure to said plates at least 18 inches behind said source of electric current.
7. The process according to claim 1 further comprising the step of applying pressure to said plates at least 36 inches behind said source of electric current.
- 5 8. The process according to claim 1 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of said metal plate that said contact surface contacts.
9. A welding process comprising the steps of:
- (a) providing at least two metal plates having upper and lower surfaces and ends;
- 10 (b) positioning said plates end to end on a welding bed forming a weld butt between said ends;
- (c) arcing electric current from a source of electric current to said plates, thereby melting said ends and creating a welded seam between said plates;
- (d) applying pressure to a surface of said plates with at least one pressure applicator positioned on each side of said weld butt, said pressure applicators configured to extend behind said source of electric current, said pressure applicators
- 15 configured to apply sufficient pressure to said plates to prevent said seam from being substantially distorted while said welded seam solidifies; and
- (e) moving said plates so that said current source arcs electric current to said plates
- 20 along said weld butt.
10. The process according to claim 9 wherein said pressure applicators comprise one or more rollers.
11. The apparatus according to claim 9 wherein at least one of said pressure

applicators is horizontally positionable.

12. The process according to claim 9 wherein at least one of said pressure applicators is vertically positionable.

13. The process according to claim 9 wherein said pressure applicators extend at  
5 least 18 inches behind said source of electric current.

14. The process according to claim 9 wherein said pressure applicators extend at least 36 inches behind said source of electric current.

15. The process according to claim 9 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape  
10 of the surface of said metal plate that said contact surface contacts.

16. A welding apparatus comprising:

- (a) a welding bed configured to support at least two metal plates having upper and lower surfaces and ends in an end-to-end relationship with a weld butt between said ends;
- 15 (b) a source of electric current positioned to allow said current to pass from said current source to said plates, whereby a welded seam may be formed between said plates, said source of electric current configured to move in a path that substantially follows said weld butt between said plates; and,
- (c) at least one pressure applicator positioned on each side of said weld butt and  
20 positioned to contact said plate at a position adjacent to the ends of said plate on a surface of each plate, said pressure applicators configured to extend behind said source of electric current relative to the direction of movement of said source of electric current, whereby pressure may be applied to said plates using

said pressure applicators.

17. The apparatus according to claim 16 wherein said pressure applicators comprise one or more rollers.
18. The apparatus according to claim 16 wherein at least one of said pressure applicators is horizontally positionable.
19. The apparatus according to claim 16 wherein at least one of said pressure applicators is vertically positionable.
20. The apparatus according to claim 16 wherein said pressure applicators extend at least 18 inches behind said source of electric current.
21. The apparatus according to claim 16 wherein said pressure applicators extend at least 36 inches behind said source of electric current.
22. The apparatus according to claim 16 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of said metal plate that said contact surface contacts.
23. A welding apparatus comprising:
  - (a) a welding bed configured to support at least two metal plates having upper and lower surfaces and ends in an end-to-end relationship with a weld butt between said ends, said welding apparatus configured to move said plates in a direction that substantially follows said weld butt between said ends;
  - (b) a source of electric current positioned sufficiently near said bed to allow said current to pass from said current source to said plates, whereby a welded seam may be formed between said plates; and,
  - (c) at least one pressure applicator positioned on each side of said weld butt and

positioned to contact said plate at a position adjacent to the ends of said plate on a surface of each plate, said pressure applicators configured to extend behind said source of electric current relative to the direction of movement said plates, whereby pressure may be applied to said plates using said pressure applicators.

5        24.    The apparatus according to claim 23 wherein said pressure applicators comprise one or more rollers.

25.    The apparatus according to claim 23 wherein at least one of said pressure applicators is horizontally positionable.

10       26.    The apparatus according to claim 23 wherein at least one of said pressure applicators is vertically positionable.

27.    The apparatus according to claim 23 wherein said pressure applicators extend at least 18 inches behind said source of electric current.

28.    The apparatus according to claim 23 wherein said pressure applicators extend at least 36 inches behind said source of electric current.

15       29.    The apparatus according to claim 23 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of a metal plate that said contact surface contacts.

30.    A welding process comprising the steps of:

20       (a)    providing at least two metal plates, each said plate having at least a concave surface and ends;

(b)    positioning said plates end to end on a welding bed so that at least a portion of said concave surface faces said welding bed and so that a weld butt is formed between said ends;

- (c) arcing electric current from a source of electric current to said plates, thereby melting said ends and creating a welded seam between said plates;
- (d) applying pressure to a surface of said plates with at least one pressure applicator positioned on each side of said weld butt, said pressure applicators configured to extend behind said source of electric current, said pressure applicators configured to apply sufficient pressure to said plates while said welded seam sufficiently solidifies; and
- (e) moving said current source along a path substantially following said weld butt between said ends;

- 10 31. The process according to claim 30 wherein said pressure applicators comprise one or more rollers.
32. The process according to claim 30 further comprising the step of securing said plates to said bed.
33. The process according to claim 30 wherein at least one of said pressure applicators is horizontally positionable.
- 15 34. The process according to claim 30 wherein at least one of said pressure applicators is vertically positionable.
35. The process according to claim 30 wherein said pressure applicators extend at least 18 inches behind said source of electric current.
- 20 36. The process according to claim 30 wherein said pressure applicators extend at least 36 inches behind said source of electric current.
37. The process according to claim 30 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape

of the surface of said metal plate that said contact surface contacts.

38. A welding process comprising the steps of:

- (a) providing at least two metal plates having upper and lower surfaces and ends, at least one of said surfaces comprising a convex surface;
- 5 (b) positioning said plates end to end on a welding bed so that at least a portion of said convex surface faces said welding bed and so that a weld butt is formed between said plates;
- (c) arcing electric current from a source of electric current to said plates, thereby melting said ends and creating a welded seam between said plates;
- 10 (d) applying pressure to a surface of said plates with at least one pressure applicator positioned on each side of said weld butt, said pressure applicators configured to extend behind said source of electric current, said pressure applicators configured to apply sufficient pressure to said plates to prevent said seam from being substantially distorted while said welded seam solidifies; and
- 15 (e) moving said plates so that said current source arcs electric current to said plates along said weld butt.

39. The process according to claim 38 wherein at least one of said pressure applicators is horizontally positionable.

40. The process according to claim 38 wherein at least one of said pressure applicators is vertically positionable.

41. The process according to claim 38 wherein said pressure applicators extend at least 18 inches behind said source of electric current.

42. The process according to claim 38 wherein said pressure applicators extend at

least 36 inches behind said source of electric current.

43. The process according to claim 38 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of said metal plate that said contact surface contacts.

5 44. An apparatus for preventing significant distortion of metal objects during a welding process, wherein said metal objects have ends, said metal objects positioned end to end forming a weld butt between said ends where a welded seam is created during said welding process, said apparatus comprising:

- 10 (a) a first pressure applicator configured to contact at least a portion of a first metal object adjacent to said weld butt;
- (b) a second pressure applicator configured to contact at least a portion of a second metal object adjacent to said weld butt;
- (c) wherein said pressure applicators are configured to apply pressure to said objects until said welded seam has sufficiently solidified to resist
- 15 significant distortion of said metal objects.

45. The apparatus according to claim 44 wherein at least one of said first or second pressure applicators is horizontally positionable.

46. The apparatus according to claim 44 wherein at least one of said first or second pressure applicators is vertically positionable.

20 47. The apparatus according to claim 44 wherein said pressure applicators extend at least 18 inches behind a source of electric current used to weld said objects together.

48. The apparatus according to claim 44 wherein said pressure applicators extend at



least 36 inches behind a source of electric current used to weld said objects together.

49. The apparatus according to claim 44 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of said metal object that said contact surface contacts.

50. The apparatus according to claim 49 wherein said contact surface has a shape selected from the group consisting of planar, convex, and concave.

51. A process for forming a tubular member comprising the steps of:

(a) providing a metal plate having ends and bending said plate until two ends of said plate are positioned adjacent to each other whereby a weld butt is formed between said ends;

(b) positioning said plate on a welding bed;

(c) arcing electric current from a source of electric current to said plate, thereby melting said ends and creating a welded seam between said ends;

(d) moving said current source along a path substantially following said weld butt between said ends;

(e) providing at least one pressure applicator positioned on each side of said weld butt, said pressure applicators configured to extend behind said source of electric current relative to the direction said source of electric current is moved; and

(f) applying pressure to said plate with said pressure applicators along said welded seam, whereby said pressure applicators substantially prevent said welded seam from being significantly distorted as said welded seam solidifies.

52. The process according to claim 51 wherein at least one of said pressure

applicators is horizontally positionable.

53. The process according to claim 51 wherein at least one of said pressure applicators is vertically positionable.

54. The process according to claim 51 wherein said pressure applicators extend at  
5 least 18 inches behind said source of electric current.

55. The process according to claim 51 wherein said pressure applicators extend at least 36 inches behind said source of electric current.

56. The process according to claim 51 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape  
10 of the surface of a metal plate that said contact surface contacts.

57. A process for forming a tubular member comprising the steps of:

(a) providing a metal plate having ends and bending said plate until two ends of said plate are positioned adjacent to and substantially parallel to each other, whereby said ends form a weld butt;

15 (b) positioning said plate on a welding bed so that said adjacent plate ends are positioned over a backing bar;

(c) arcing electric current from a source of electric current through said weld butt to said plate, thereby melting said ends and creating a welded seam;

(d) moving said plate so that said current source arcs electric current through and  
20 along said weld butt;

(e) providing at least two pressure applicators positioned adjacent to and on opposite sides of said weld butt, said pressure applicators configured to extend behind said source of electric current relative to the direction said plate is

moved; and

- (f) applying pressure to said plate with said pressure applicators along said welded seam, whereby said pressure applicators will substantially prevent movement of said plate along the welded seam as said welded seam solidifies.

5      58.    The process according to claim 57 wherein at least one of said pressure applicators is horizontally positionable.

59.    The process according to claim 57 wherein at least one of said pressure applicators is vertically positionable.

10      60.    The process according to claim 57 wherein said pressure applicators extend at least 18 inches behind said source of electric.

61.    The process according to claim 57 wherein said pressure applicators extend at least 36 inches behind said source of electric current.

15      62.    The process according to claim 57 wherein said pressure applicators comprise at least one contact surface, said contact surface substantially mirroring the shape of the surface of a metal plate that said contact surface contacts.

20      63.    An improved process for preventing distortion of metal objects during a welding process wherein two metal objects are welded together using a source of electric current that creates a welded seam between said metal objects, said improvement comprising the step of applying pressure to said metal objects along said welded seam and behind said source of electric current while said welded seam solidifies.

64.    The process according to claim 63 further comprising the step of applying pressure to said plates at least 18 inches behind said source of electric current.

65. The process according to claim 63 further comprising the step of applying pressure to said plates at least 36 inches behind said source of electric current.
66. The process according to claim 63 wherein a filler metal is provided between said metal objects.
- 5 67. A process according to claims 1, 9, 30, 38, 51, 57, or 63 wherein said pressure applicators are configured to apply pressure to said plate or plates before said source of electric current as well as after said source of electric current.
68. An apparatus according to claims 16, 23, or 44 wherein said pressure applicators are configured to apply pressure to said plate or plates before said source of electric current as well as after said source of electric current.
- 10 69. A process according to claims 1, 9, 30, 38, 51 or 57 wherein said weld butt is provided with a filler metal to promote the formation of a weld seam.
70. An apparatus according to claims 16, 23, or 44 wherein said weld butt is provided with a filler metal to promote the formation of a weld seam.